

page 4, line 24, through page 5, line 1. One of the advantages for using one of the selected five species of pine is related to the ability of these species to advantageously become impregnated with, and can quickly be stripped of, solvents, alkanolic anhydrides and alkanolic acids. This ability advantageously leads to an overall processing period from drying to stripping that is minimized. See the present application at page 6, lines 13-20. Applicants have reviewed Brelid and do not believe the reference describes either expressly or inherently one of the five species of pine recited in Claim 20.

Applicants submit that the pine described in Brelid does not appear similar in absorption properties compared to one of the five species. Accordingly, applicants submit that the pine used in the reference cannot be one of the recited five species. This is evidenced by the reference's own discussion of the impregnation period required to impregnate the wood samples with acetic anhydride. For example, in Brelid, at page 384, paragraph 2.2, Brelid describes that wood sample preparation includes pressure impregnation with acetic anhydride at 10 bar for about two hours. In direct contrast with Brelid, the process recited in Claim 20 describes impregnating loblolly, slash, longleaf, shortleaf, or radiata pine wood having less than about 8% water by weight with alkanolic anhydride, wherein the impregnation time is about 15 to about 30 minutes. At the very least, the process used to create the claimed wood product requires one-fourth of the time to impregnate with acetic anhydride as compared to the pine described in Brelid. It is also noteworthy that the reference describes the impregnation of wood samples; therefore, suggesting that impregnation time may be even longer for a salable commercial product.

Applicants believe that even though product-by-process claims are, in part, defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as, or obvious from, a product of the prior art, the claim is unpatentable, even though the prior product was made by a different process. Brelid does not teach or suggest one

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of the five species of pine recited in Claim 1. Applicants submit that the pine described in Brelid appears to have different absorption properties and, therefore, cannot be one of the pine species of Claim 1. Accordingly, the rejection of Claim 20 as being anticipated by Brelid is improper.

Furthermore, Claim 20 is not obvious in view of Brelid. For a *prima facie* case of obviousness, there must first be either a suggestion or a motivation in the prior art reference or knowledge generally available to modify a reference or to combine references. There must be a reasonable expectation of success, and all the claim limitations must be taught or suggested in the prior art references. The Examiner appears to be relying on perceived similarities in the process steps to conclude that the product resulting from the steps recited in Claim 20, and the product described in Brelid would be obvious from each other.

Applicants submit that the Examiner's understanding of the process of Brelid is in error. When the proper teachings of Brelid are considered and compared against Claim 20, applicants submit that the Examiner's rejection based on obviousness is untenable. Claim 20 recites two steps that applicants intend to show are not described by Brelid: "(a) impregnating loblolly, slash, longleaf, shortleaf, or radiata pine wood having less than about 8% water by weight with alkanoic anhydride, wherein the impregnation time is about 15 to about 30 minutes," and "(c) removing alkanoic anhydride and alkanoic acid from said esterified wood, wherein the removal time is less than about 120 minutes to achieve esterified wood having less than about 1% combined alkanoic anhydride and alkanoic acid."

In rejecting Claim 20 based on Brelid purportedly teaching the former step (a), the Examiner states that Brelid discloses a "process comprising using an untreated pine wood having a moisture content of less than 8%," and references Table 4 for such proposition. Applicants respectfully disagree with the Examiner's characterization of Brelid. Applicants submit that Table 4 includes the moisture content of the acetylated wood, not untreated wood. The

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description of Table 4 clearly indicates "MOR and MOE for acetylated pine." (Emphasis added.) Accordingly, Brelid does not teach or suggest a moisture content of 8% for untreated wood.

In rejecting Claim 20 based on Brelid purportedly teaching the latter step (c), the Examiner states that Brelid discloses a "process comprising . . . removing of excess acetic anhydride and by-product acetic acid by evaporation under vacuum for two hours at 120 degrees C to produce a final wood product having a total residue chemicals of about 1.6%," and refers to the first paragraph, Introduction, and Sections 2.5 and 3.4 for such proposition. Applicants respectfully disagree with the Examiner's characterization of Brelid.

Brelid describes total residual chemicals of about 1.6%, which applicants submit is not less than about 1%. The Examiner justifies his position by stating,

[s]ince the pinewood of Brelid is made by a process substantially identical with the process of the claim, it's reasonably expected that the esterified pinewood of Brelid would also have less that [sic] about 1% of combined acetic anhydride and by-product acetic acid. If there is any difference, the difference must be minor and obvious.

Applicants respectfully disagree. Acetic anhydride is the reactant introduced into the wood and acetic acid is the by-product of the reaction. If there are other residual chemicals neither Brelid nor the Examiner have disclosed them. Therefore, applicants submit that the acetic anhydride and acetic acid constitute nearly the entire residual chemicals, meaning that Brelid more accurately describes that acetic anhydride and acetic acid are closer to 1.6%, as compared to less than 1.0%, as recited in Claim 1.

The Examiner further states,

Brelid discloses that the total residue chemicals that include acetic anhydride, by-product acetic acid and other solvents used in the process are about 1.6%. It is reasonable to expect that the combined acetic

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anhydride and acetic acid in the final esterified wood is less than 1% as being claimed. It [sic] it's not, it would be very close to the claimed range and it would have been obvious to one having ordinary skill in the art to modify the esterified pinewood of Brelid by further removing the residual chemicals to a level where the combined acetic anhydride and acetic acid being less than 1% in order to improve the structure of the final wood product.

Applicants respectfully disagree. Applicants have reviewed Brelid but did not find the "other residual solvents" that are supposed to account for part of the total residual chemicals of about 1.6%. Brelid discusses the removal of excess acetic anhydride and by-product acetic acid in Section 2.5. Brelid does not discuss the components of the residual chemicals in Section 3.4. Brelid does not describe the components of the residual chemicals in the first paragraph of the Introduction. As stated before, applicants submit that substantially all the residual chemicals in Brelid constitute acetic anhydride and acetic acid; therefore, the combination of acetic anhydride and acetic acid in Brelid is closer to 1.6%.

Applicants have shown that Brelid fails to teach or suggest untreated wood having a moisture content of 8% being impregnated for 15 to 30 minutes. Brelid further fails to teach or suggest a removal time of less than 120 minutes to achieve having less than 1% combined alkanoic anhydride and alkanoic acid. For all these reasons, applicants submit that the Examiner's rejection of Claim 20, either under anticipation or obviousness is improper.

Accordingly, applicants respectfully request withdrawal of the rejection of Claim 20.

The Rejection of Claims 19 and 20 Under 35 U.S.C. § 103(a)

Claims 19 and 20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Brelid et al. in view of U.S. Patent No. 4,804,384 (Rowell et al.). Applicants respectfully disagree.

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The Examiner states that,

Brelid does not disclose the impregnating time of 15 to 30 min. The US'384 teaches impregnating [sic] time between 1-15 min (col. 4, lines 1-62). It is well within the skill of an average artisan to increase the impregnation time for wood pieces having bigger dimensions to allow the acetic anhydride to penetrate into the wood fibers. It would have been obvious to one having ordinary skill in the art to increase time of impregnation as taught by US'384 since such would allow sufficient time for the acetic anhydride to penetrate into the wood structure.

Both Claims 19 and 20 recite the same process steps. While Claim 19 is a method claim, Claim 20 is a product-by-process claim, and, therefore, Claim 20 must be judged based on the product, not the method.

The Examiner makes the argument that the impregnation time of 1 to 15 minutes described in U.S. Patent No. 4,804,384 can be increased since such would allow sufficient time for the acetic anhydride to penetrate into the wood structure. First, the Examiner has merely described increasing the impregnation time of Rowell, but has not placed an upper limit on the impregnation time. Supposedly, the Examiner is stating that the impregnation time can be increased from the 1 to 15 minutes taught by Rowell to within the range of about 15 to about 30 minutes, which is what is recited in Claims 19 and 20. Obviousness, however, requires some suggestion or motivation and a reasonable expectation of success.

Regardless of the teachings of Rowell, Brelid explicitly teaches that impregnation with acetic anhydride was carried out under pressure at 10 bar for about two hours, which is considerably less than the 1 to 15 minutes taught by Rowell. See Brelid, Section 2.2. Thus, if the Examiner is correct in modifying Brelid with the teachings of Rowell, the impregnation time is reduced from two hours to something less than two hours. Applicants submit such

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modification of Brelid would not be expected to succeed in terms of achieving the expected degree of acetylation of the wood sought by Brelid.

As discussed above, applicants have shown that the process of Brelid is not close to "substantially comprising every limitation of the instant claimed process." Those same reasons are applicable in this section as well.

Both Claims 19 and 20 recite, "impregnating loblolly, slash, longleaf, shortleaf or radiata pine wood having less than about 8% water by weight with alkanoic anhydride, wherein the impregnation time is about 15 to about 30 minutes."

Both Claims 19 and 20 recite, "removing alkanoic anhydride and alkanoic acid from said esterified wood, wherein the removal time is less than about 120 minutes to achieve esterified wood having less than about 1% combined alkanoic anhydride and alkanoic acid."

As discussed above, applicants submit that the Examiner's understanding of the teachings of Brelid is in error. Applicants submit that Brelid does not teach or suggest, at the very least:

(1) impregnating loblolly, slash, longleaf, shortleaf or radiata pine wood having less than about 8% water by weight with alkanoic anhydride, wherein the impregnation time is about 15 to about 30 minutes, or

(2) removing alkanoic anhydride and alkanoic acid from said esterified wood, wherein the removal time is less than about 120 minutes to achieve esterified wood having less than about 1% combined alkanoic anhydride and alkanoic acid.

Accordingly, for the reasons discussed in this and the previous section, the rejection of Claims 19 and 20 is improper. Therefore, applicants respectfully request the withdrawal of the rejection of Claims 19 and 20.



The Rejection of Claims 1-20 Under 35 U.S.C. § 103(a)

Claims 1-20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Brelid in view of U.S. Patent No. 3,094,431 (Goldstein et al.). Applicants respectfully disagree.

The Examiner states that, "Brelid does not teach removing moisture from the starting wood with solvent." The Examiner further states that,

The US'432 teaches the use of solvent, see Fig 1, and claim 1. It would have been obvious to one having ordinary skill in the art to modify process of Brelid by using a high temperature solvent to remove water as taught by USP'431 prior to impregnating the wood in order to enhance the impregnation of acetic anhydride into the cellulose fibers.

For a *prima facie* case of obviousness, there must first be a suggestion or a motivation either in the references or in the knowledge generally available to modify a reference or to combine references. Second, there must be a reasonable expectation of success, and, third, all the claim limitations must be taught or suggested by the prior art references.

"The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990); M.P.E.P. Section 2143.01, p. 2100-124, August 2001. Applicants submit that there is neither a suggestion or motivation for combining Goldstein with Brelid, and even if combined, the combination fails to teach or suggest all claim limitations. The stated motivation for combining Goldstein with Brelid is so vague as to be meaningless, and does not take into consideration the actual teachings of the references. Applicants submit that the Examiner's failure to consider the teachings of the references, as a whole, led to an improper rejection based on obviousness. A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention.

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Goldstein describes a process for acetylating wood of substantial length, width and thickness by impregnating the wood with acetic anhydride in an inert nonswelling solvent under pressure at an elevated temperature. See Col. 2, lines 1-5. Applicants believe the use of a solvent with acetic anhydride is used in Goldstein for two purposes. First, the use of a high boiling point solvent allows the reaction temperature to be raised enough so that the acetylation takes place at a reasonable rate even without a catalyst. See Col. 2, line 64 to Col. 3, line 4. Second, the high boiling point solvent also facilitates the removal of by-product acetic acid and excess acetic anhydride during vapor drying. See Col 3, lines 13-15. Goldstein further teaches the total time for impregnation and reaction proceeds at about 125°C for 8 to 12 hours. See Col. 2, lines 30 to 33; Col. 4, lines 45 to 49. By contrast, Brelid teaches impregnation for two hours. See Section 2.2. Brelid further teaches a reaction time of less than about 240 minutes (4 hours) at 120°C and 130°C. See Fig. 3. Thus, for about the same temperature as taught by Rowell, Brelid only teaches a combined impregnation time and reaction time of 6 hours. Since the combined impregnation and reaction period is already less than Rowell, it is pointless to use solvent to "enhance the impregnation of acetic anhydride into the cellulose fibers," as suggested by the Examiner. Applicants submit that the motivation offered by the Examiner is contradicted by the actual teachings of the references and, therefore, cannot support a rejection based on obviousness.

Furthermore, obviousness requires that every limitation in a claim be taught or suggested by the prior art. Even if combined, neither Brelid nor Goldstein teaches or suggests drying wood to less than about 8% water by weight. Claims 2-18 depend directly or indirectly from Claim 1. Goldstein appears to be used only in rejecting Claims 1-18, but not 19 and 20. The errors in rejecting Claims 19 and 20 based on Brelid have been discussed in previous sections. Accordingly, these claims are submitted to be allowable.





Accordingly, applicants respectfully request the withdrawal of the rejection of Claims 1-20.

The Rejection of Claims 2-18

Applicants note that the Examiner has not identified where any one or combination of references teaches or suggests the limitations in Claims 2-18. Applicants submit that each one of Claims 2-18 patentably defines over the references of record. Applicants respectfully request, should a second Office Action be issued before a Notice of Allowance, that a discussion is provided of how or why the reference or combination of references teaches or suggests each limitation pertaining to each rejected claim.

CONCLUSION

In view of the foregoing discussion, applicants respectfully submit that Claims 1-20 are in condition for allowance. If the Examiner has any further questions or comments, the Examiner may contact the applicants' attorney at the number provided below.

Respectfully submitted,

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